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Periodicity -

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Periodicity - elements w/ similar props Recur @ Regular Intervals on the Periodic Table

Based on Periodicity, Mendeleev was able
to predict the existence & props of undiscovered elements

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Why does Periodicity occur?

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happens b/c outer shell e- configs Repeat

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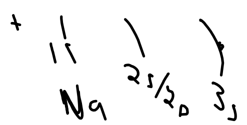

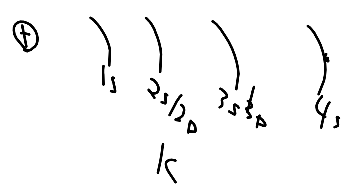

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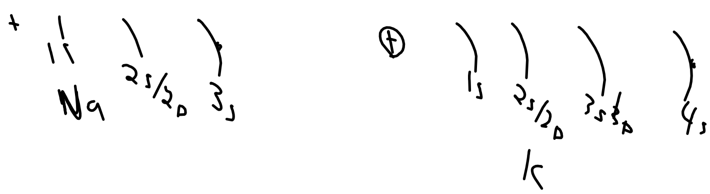
Down a Group, More Reactive - b/c outer e^- get more easily B/c they're farther away from nuclear charge.



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f-block –

Rare-Earth elements

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f-block – Lanthanides
Rare-Earth elements – Actinides

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some of last elements discovered

f-block – Lanthanides – Shiny Reactive metals – color TV's

Rare-Earth elements – Actinides – Radioactive Man-made

Trends in Per Table

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Atomic Radius

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Atomic Radius - size of atom

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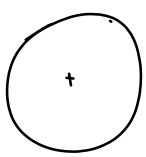
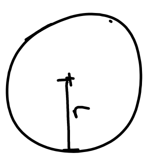
Atomic Radius - size of atom



Trends in Per Table

Atomic Radius - size of atom



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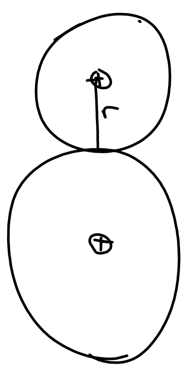

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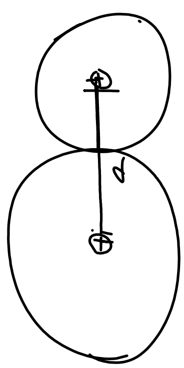

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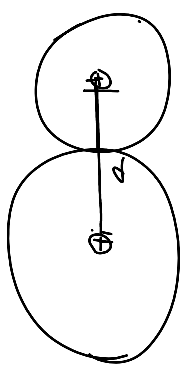
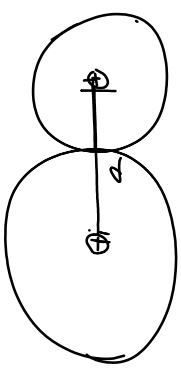


$AR = \frac{d}{2}$

Trends in Per Table

Atomic Radius - size of atom

$\frac{1}{2}$ the dist b/w nuclei of adjacent atoms



$$AR = \frac{d}{2}$$

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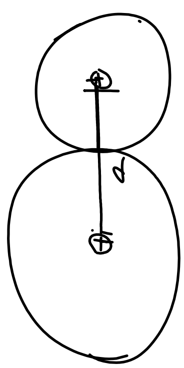
Atomic Radius - size of atom

½ the dist b/w nuclei of adjacent atoms



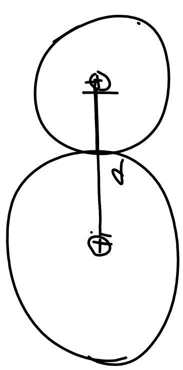
$AR = \frac{d}{2}$

For Li:

Trends in Per Table

Atomic Radius - size of atom

→ $\frac{1}{2}$ the dist b/w nuclei of adjacent atoms



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For Li: $d = 304\,pm$

$AR =$

Trends in Per Table

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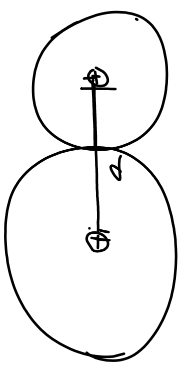

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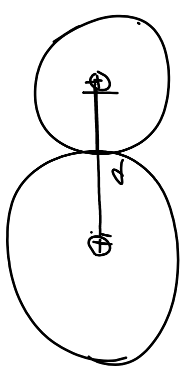

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For Li: $d = 304\,pm$

$AR = \frac{304\,pm}{2} = 152\,pm$

$1\,pm = 1 \times 10^{-12}\,m$

Trends in AR

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Across a Period (L→R)

Trends in AR

Across a Period (L→R) AR ↓

Trends in AR

Across a Period (L→R) AR ↓, why? B/c

Trends in AR

Across a Period (L→R) AR ↓, why? B/c more p are added to the nucleus making it more +, The greater + charge more strongly attracts e⁻, making the AR smaller

Group Trend in AR

Group Trend in AR

Down a group, AR

Group Trend in AR

Down a group, AR ↑

Group Trend in AR

Down a group, AR ↑ why? B/c

Group Trend in AR

Down a group, AR ↑ why? B/c Down the group the number of E-levels of e⁻ increases making the size of the atoms larger

Ionization E -

Ionization E - E change needed to Remove an e^-

Ionization E - E change needed to Remove an e⁻
(cation formation)

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$A + E \longrightarrow$
(atom)

Ionization E - E change needed to Remove an e^-

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$$\underset{\text{(atom)}}{A} + E \longrightarrow A^+ + e^-$$

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Group Trend Down

<u>Group Trend</u> Down a group, IE decreases

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why? B/c the e⁻ get farther away from the nucleus as more E-levels are added so they experience pull from the nucleus and are more easily Removed.

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Across a Period -

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opp of AR

Across a Period - IE ↑, b/c the increasing nuclear charge (+ of p) increases, and e⁻ are more tightly held to nucleus. So more E is Req'd to Remove e⁻

Ionic Radii

Ionic Radii

cation vs atoms

Ionic Radii

cation vs atom
(form by
losing e⁻)

Ionic Radii

cation vs atoms
(form by losing e⁻)

cations are smaller than atoms
B/c when an e⁻ is Removed the nucleus attracts the Remaining e⁻ more.

anion size

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↳ anions larger than their respective atoms
B/c more e^- in the e^- cloud repel each
other making the cloud larger.

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→ scale 0.0-4.0

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H - H
2.1 2.1

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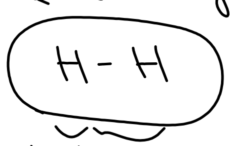

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H - Cl
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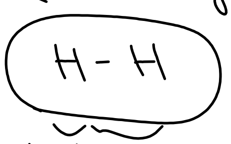

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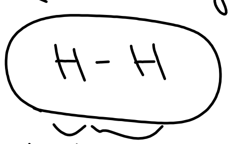

No diff in e-neg So e- are equally shared.

← Cl attracts more strongly now there are (+) & (-) ends of the molecule.

diff in e-neg So unequal e- sharing (Cl hogs the e-)

Across a Period e⁻neg ↑.

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<u>Down a Group</u> e-neg ↓ b/c

<u>Across a Period</u> e-neg ↑. B/c more p in the nucleus will increase the attraction of e⁻ from other atoms.

<u>Down a Group</u> e-neg ↓ b/c atoms get larger the attraction for e⁻ decreases b/c incoming e⁻ are further away from the nucleus.